TRIBUTARY TRIBUNE

Volume 26, Issue 2
District B

Stories and art by Year 26, District B Members of the California Conservation Corps Watershed Stewards Program in partnership with AmeriCorps.

Shayda Abidi and Adrienne Chenette, serving at the Russian River Salmon and Steelhead Monitoring Program with a young volunteer at Petaluma Community Garden for Martin Luther King Jr. Day, a National Service Day.

"Water's force shapes human society, centering our civilization around the nourishment it readily provides. It creates the pathways that connect seas to mountainous peaks; unique and rich habitats that support a colorful variety of life and land. "

- Jordan Garcia

Salmon in Shifting Seas: Closing the Data Gap in Restoration Ecology

By: Kate Stonecypher, Placed at CA Department of Fish and Wildlife Coastal Watershed Planning & Assessment Program

Since its inception, salmonid restoration has focused largely on targeted habitat improvements within freshwater streams. Engineered log jams, rock weirs, and willow plantings are all popular methods of restoration that appease funders and the public alike, but do they really alleviate the environmental stressors that kill salmon runs? In order to answer that question, managers must first understand exactly what those stressors are and how they affect salmon.

Spending countless hours and large sums of money improving stream habitat can be discouraging for restorationists when despite all their efforts, salmon are not returning from the ocean to spawn. The future of salmonid restoration lies in the answer to two difficult questions: what happens to salmon in the ocean, and how are they affected by a changing climate?
Scientists have observed an increase in marine heat waves (liver et al 2018). Affectionately termed "the Blob", extreme ocean temperatures such as those observed in 2013-2015 can severely disrupt many important ecological processes within the marine environment. A notable effect of marine heat waves is the increase in

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In This Issue

A program of the California Conservation Corps, WSP is one of the most productive programs for future employment in natural resources. WSP is administered by CaliforniaVolunteers, the Office of the Governor and sponsored by the Corporation for National and Community Service and the California Department of Fish and Wildlife.

Portrait of a California Tiger Salamander by Adrienne Chenette, serving at the Russian River Salmon and Steelhead Monitoring Program.

A Look at Natural Channel Design

By: Teague Tran, Placed at Point Reyes National Seashore

The modern environmental movement has inspired generations of people to become more environmentally conscious than ever before. This is reflected in the fact that stream restoration and mitigation has developed into a billion-dollar industry that not only improves our natural resources, it creates jobs as well. One of the most widely-used restoration methods for streams is called "natural channel design", where engineers take impaired streams and reconstruct channels based on the Rosgen Classification System, which classify stable, single-thread, meandering channels as the most ideal form of a river. However, critics of this method argue that although these types of projects are relatively easy to implement, applying them indiscriminately can be ineffective and costly.

One such critic is Mathias Kondolf, a professor of Landscape Architecture and Environmental Planning at UC Berkeley. In 2005, he addressed this issue through his article "River Restoration and Meanders", where he states that the indiscriminate application of "natural channel design" to rivers is leading to the failure of many restoration projects. He argues that although this method will work on rivers that have historically had these types of bends, not all rivers are the same. Natural channel design has been implemented on streams that are not historically meandering and ones that meander irregularly, which creates unnatural habitats and has limited ecological benefits.

Kondolf goes on to provide case studies that shed light on the shortcomings of natural channel design and the Rosgen

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California Tiger Salamander

By: Adrienne Chenette, Placed at Russian River Salmon and Steelhead Monitoring Program

Sonoma County is home to one of three distinct population segments of the federally- and state-listed endangered California Tiger Salamander, *Ambystoma californiense.* They reside mostly underground in upland mammal burrows and surface to reproduce in seasonal wetlands.

Due to urbanization and agriculture, much of their habitat has disappeared or become fragmented and degraded. As their natural ephemeral breeding ponds disappear, some individuals have been reported breeding in artificial pools such as livestock ponds and roadside ditches that temporarily collect water.

For the long-term viability of this species, the U.S. Fish and Wildlife Service has designated areas of land between upland burrows and breeding ponds as "critical habitat" to maintain habitat connectivity.

WSP Members have the opportunity to site share with other peers at their respective Placement Sites. Here, Members are collecting flow measurements in Santa Rosa. Pictured left to right: Jordan Garcia (NCRWQCB), Zack Pattek, Logan McDiffit (The Watershed Center) and Emmy Anzalone (NCRWQCB). Photo credit: NCRWQCB.

About the Watershed Stewards Program

Since 1994, the Watershed Stewards Program (WSP) has been engaged in comprehensive, community-based, watershed restoration and education throughout coastal California.

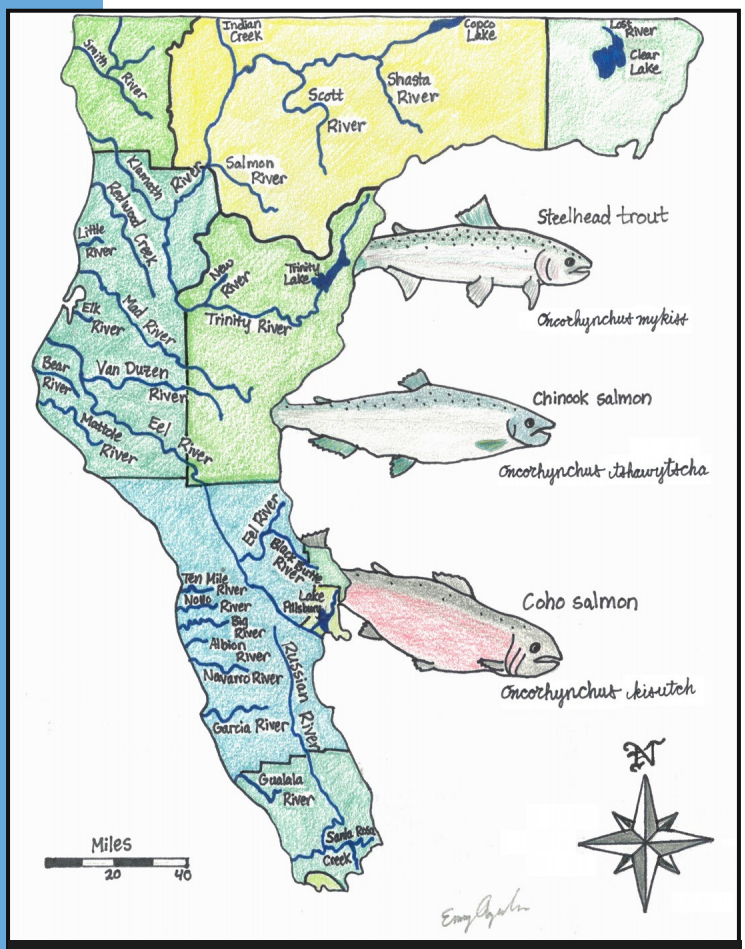
WSP was created in 1994 by California Department of Fish and Wildlife (CDFW) biologists, educators, and the California Conservation Corps to fill critical gaps in scientific data collection, n-stream restoration, and watershed education. In collaboration with landowners, tribal communities, teachers, community members, nonprofit organizations, and government agencies, WSP works to revitalize watersheds that contain endangered and threatened salmonid species (Chinook Salmon, Coho Salmon, and Steelhead Trout) by using state-of-the-art data collection and watershed restoration techniques. WSP also engages members in education, outreach, and volunteer recruitment efforts to increase the capacity of partner organizations. WSP currently has Members working from the Oregon border to the Santa Monica Mountains.

A fish found during a flow monitoring survey with NCRWQCB. Photo credit: NCRWQCB

The North Coast

By: Emmy Anzalone, Placed at North Coast Regional Water Quality Control Board

At the North Coast Regional Water Quality Control Board (NCRWQCB) Site, we do not work directly with salmonids. Instead, we help them by monitoring their habitat: the waters of California's North Coast.



A map of the North Coast Region, associated waterways and salmonid species, hand-drawn by Emmy Anzalone, serving at the North Coast Regional Water Quality Control Board.

One of our main projects is to conduct flow monitoring surveys on streams throughout the North Coast region, and develop hydrographs (records of streamflow or height over time) for these streams. This project aims to identify patterns of water use and quantify the associated water quality impacts. Some of these streams have very low flows during the summer, and even dry up completely. The data collected through this study may help the NCRWQCB identify priorities for permitting actions and future water conservation regulations, to ensure these streams have enough water flowing through them for salmonids.

The North Coast Region includes all coastal-draining streams from the Oregon border to the mouth of Tomales Bay – a total area of almost 20,000 square miles! This map represents the North Coast, including county boundaries and major rivers and creeks, with the three salmonid species of our region: steelhead trout (*Oncorhynchus mykiss*), Chinook salmon (*Oncorhynchus tshawytscha*), and coho salmon (*Oncorhynchus kisutch*).

Three States

By: Jordan Garcia, Placed at North Coast Regional Water Quality Control Board

I. Ice - Water— Earth and life's great cornerstone—commands three states of matter not mutually exclusive to each other; all having their special role in shaping our world. Ice, the solid state, controls the world climate and shapes our tallest mountains, always splitting rock and grinding out grand valleys. It locks away the secrets of the world, a live archive of history's greatest contributions to mosaic Earth. Ice hosts a spectrum of well-adapted flora and fauna; stewards of rich ecosystems that depend on the uniquely intense conditions like blizzards and snow storms. From the smallest snowflake to the largest glacier, ice is the formidable force that powers slow and immense geomorphic change.

Tejon Ranch Pass , CA (Jordan Garcia)

Lake Ilsanjo, CA (Jordan Garcia)

II. Liquid - The liquid state is a dynamic form of water and it is what many of us immediately think of when we hear 'water': vast oceans, meandering rivers, crystal lakes. Fluid and unwavering, liquid water carves out our continents, cradles the existence of life on Earth, and drives the climate machine. Water's force shapes human society, centering our civilization around the nourishment it readily provides. It creates the pathways that connect seas to mountainous peaks; unique and rich habitats that support a colorful variety of life and land. Liquid water changes landscapes faster than ice, simultaneously carving out canyons and valleys while moving the dissolved sediments to estuaries and deltas, shaping coastal environments. Humans and the animals we depend on all depend on these liquid water-driven processes for survival.

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Three States, continued from page 4.

III. Vapor - Water, in its most excited and energetic state, exists as water vapor, occupying the air we breathe and the space we live in. Water vapor helps the air regulate its temperature and pressure, keeping conditions from changing too rapidly in a buffering way that helps terrestrial life adapt. When enough water vapor is present in the atmosphere as great clouds, it can generate intense storms that can deliver vast amounts of water back to dry land. In a world dominated by saline water, water vapor exists as the medium between that and the available freshwater on Earth. In this state, high in the sky, water determines its fate, returning to Earth: snow as the solid state, or rain as the liquid state. The cycle will continue, and as a reflection of that dynamic, so too will life on Earth.

Little Shasta, CA (Jordan Garcia)

It is always a treat when the entire Region gets to spend time together! This generally only happens during trainings—this photo of Region I Members is from Regional Training in November. Photo credit: Zia Schatz

Water & Wine

By: Shayda Abidi, Placed at Russian River Salmon and Steelhead Monitoring Program

California is renowned as one of the most productive areas for wine in the world. If California were its own country, it would be the fourth largest wine producer in the world after Italy, France, and Spain (Parrish 2015). When you mention Sonoma County, most conjure up images of beautiful châteaux, fancy tasting rooms, and hills covered in vineyards. However, it's not only the people and vineyards that make this area special, and they certainly aren't the only ones who rely on the flows of the Russian River.
Coho Salmon, Chinook Salmon, and steelhead trout require adequate amounts of water to survive. As cattle ranchers, farm owners, and wineries compete for this valuable resource, where do salmonids fit into the picture? In the late 90s, droughts and competition for water continued, putting salmonids in a vulnerable position. By the year 2000, coho numbers were approaching extinction in the Russian River basin (Kennedy 2014).

Two steelhead making their way up Pena Creek. Photo credit CA Sea Grant.

Luckily for our salmonid friends, biologists on the local, state and federal levels noticed these numbers and took action. Thus, the captive breeding program was created at the Don Clausen-Warm Springs Fish Hatchery (WSH) at Lake Sonoma. Using a wild population to start with, the hatchery spawns the salmon and releases them at various life stages and times of year, making sure they maintain genetic variability. Together with Sonoma Water, the Russian River

Nick Bauer, RRSSMP Mentor, holding a Chinook carcass on Redwood Reek. Photo credit: CA Sea Grant.

Salmon and Steelhead Program monitors all life cycle stages of coho, Chinook, and steelhead in the basin, as well as conducts community outreach and education. Since the inception of the WSH Coho Broodstock Recovery Program, coho numbers have grown from only 2 adult returns per year to our record in the 2017/18 Winter season reaching 763. Although endangered, coho now have teams of dedicated fisheries biologists and community members on their side, giving them a fighting chance in this agricultural hub of California. Next time you take a trip to the Russian River watershed for a wine tour, check out our local tributaries or stop by the WSH visitor's center to say hello to our special salmonids!

References:

Kennedy, Caitlyn. 2014. Pairing wine with salmon: climate lessons from California. *NOAA*. Climate.gov
Parrish, Will. 2015. Turning water into wine. *East Bay Express*.

Close Your Eyes and Picture Yourself

By: Marisa McGrew, Placed at California Conservation Corps Fortuna

Holiday with Perlodidae

Snap your two tarsal claws together

You're perched on a cobble recliner

Invertebrate friends catching river waves

Salmonids fighting the flow

Swimming over the benthos

Seeking the perfect gravel for the perfect redd

The perfect log for the perfect overhead

Cold water cocktails and gravel bar beaches

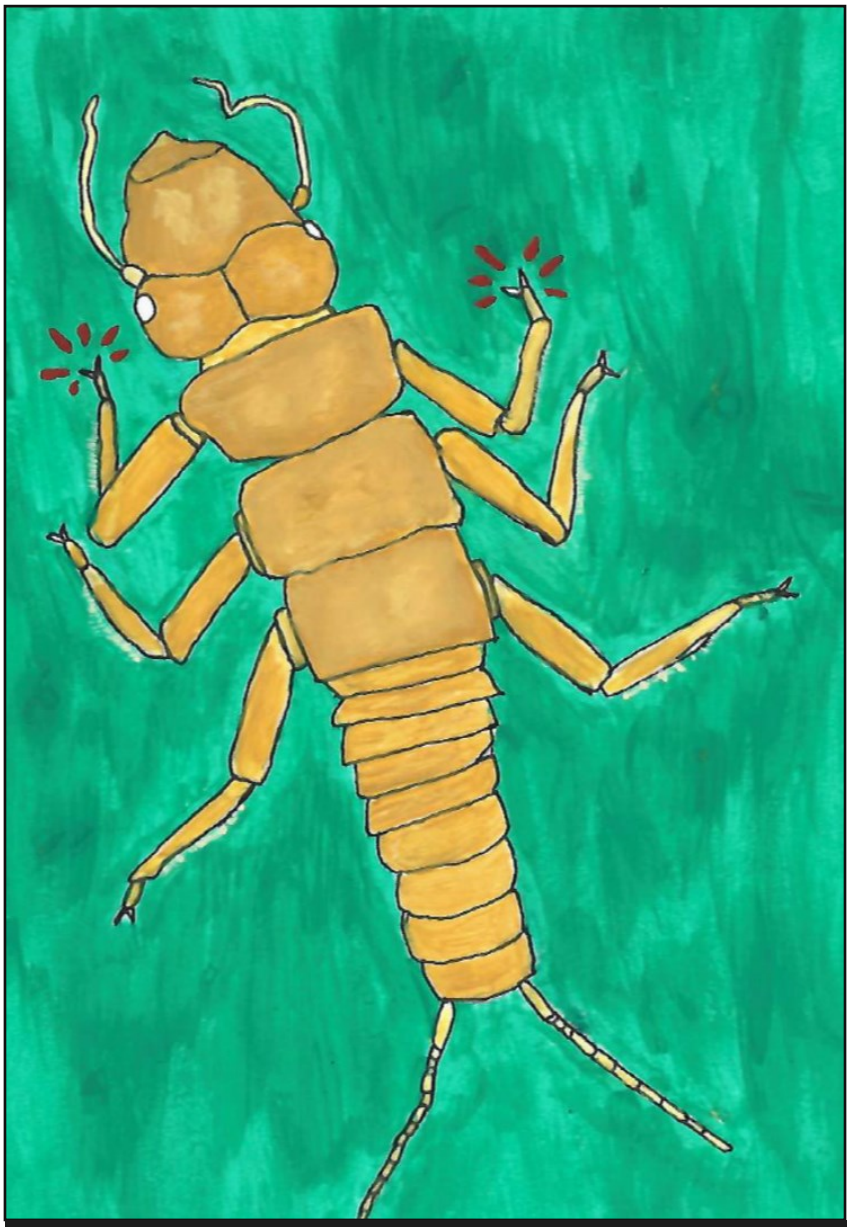
Pull up your cobble recliner

Life in the vacation river can't get any finer
Look deep in the benthos

Those unsung small heroes

Under cover they lay,

Holiday with Perlodidae



A portrait of a stonefly, family Perlodidae, by WSP Member Marisa McGrew.

Under the Redwood Canopy

By: Marelle Arndt, Placed at Point Reyes National Seashore

Under the majestic redwood canopy in Muir Woods National Monument, endangered salmonids are living in a challenging and dynamic environment. NOAA fisheries research shows that large woody debris is crucial to the survivorship of juvenile salmonids because it maintains physical complexity within creek systems (Hafs et al. 2013). Rootwads and logs disrupt water flow creating quiet pools. Juvenile salmonids use these pools as a refuge from predators, as well as a feeding ground. Pools also allow for the deposition of nutrients and sediment used by many stream organisms that would otherwise be flushed downstream. The quiet pools provide a rest area to salmonids. Fighting against swift streamflow continuously causes great energy expense for spawners.

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Under the Redwood Canopy, continued from page 7.

The Redwood Creek Salmon Habitat Enhancement Project is a multi-year effort by the Golden Gate National Parks Conservancy to create a more complex and healthy stream environment for endangered Coho salmon. In Fall of 2019, the boulder walls or "riprap" were removed from part of the Redwood Creek bank and large fallen trees from the forest floor were placed in the creek. Historically, large boulders or "riprap" along the stream bank were used to stabilize the bank while parts of the forest understory were cleared to provide visitors with better views of the largest redwoods. The biggest threat to the survival of Redwood Creek's Coho population is a lack of good stream habitat for juveniles. The boulder walls along the bank caused the stream to become a straight channel with fast moving flows, while cutting the understory of the forest decreased the amount of large woody debris in the stream. The goal of the Salmon Habitat Enhancement Project is to ensure that juvenile salmonids survive in Redwood Creek by providing them quiet pools of protection and greater access to important nutrients.

The lower left image depicts me standing beneath the expanse of redwoods in Muir Woods National Monument during a spawner survey. To my right is a fallen tree contributing to the crucial woody debris in the stream system. The image above provides a closer look at a large woody debris installment that scoured out a deep pool.

Marelle Arndt in Muir Woods National Monument on a spawner survey. To her right is a fallen tree contributing to crucial woody debris in the stream system. Photo credit: PRNS

A closer look at large woody debris installments that have scoured out a deep pool, creating more habitat for salmonids. Photo credit: PRNS

A Look at Natural Stream Design, continued from page 2.

Classification System. One such example can be seen on Uvas Creek, a stream within Santa Clara County, California, where consultants to the City of Gilroy erroneously claimed that Uvas Creek was historically a "stable C4 channel" and reconstructed the stream to be single-threaded and meandering. Although the project was completed, a flow event with a return interval of six years washed it out three months after construction. Upon further study, Kondolf found that both historical sources and geomorphic theory indicate that the channel seemed to be braided in the past, which means that Uvas Creek is not naturally a single-thread, meandering stream.

Despite the criticisms of natural channel design and the Rosgen Classification System throughout the decades, they are still used today. Although there are flaws in solely relying on the Rosgen Classification System to guide restoration, it has possible uses in land management when establishing a "common" framework to discuss ecosystem health. For example, the Natural Resource Conservation Service is using the Rosgen Classification System to develop a protocol that adapts the concept of ecological site descriptions—frameworks used to describe upland terrestrial systems—to describe riparian ecosystems (Meehan & O'Brien, 2019).

References:
Kondolf, G. (2006). River Restoration and Meanders. Ecology and Society, 11(2), 433.

Meehan, M., & O'brien, P. (2019). Using the Rosgen Stream Classification System to Aid in Riparian Complex Ecological Site Descriptions Development. Rangeland Ecology & Management, 72(5), 729-735.

Teague Tran and Marelle Arndt, serving at Point Reyes National Seashore, seining to count juvenile fish. Photo credit: PRNS

Alumni Spotlight: Meet Monica Scholey!

By: Emma Held, Placed at WSP Fortuna Office

1. What was your WSP Member experience like?

I was a WSP Member in Year 13 and 14. The first year I volunteered for the USFS Caspar Creek Watershed Study. Our winters were primarily filled with what was called Storm Duty, where we hiked throughout the experimental watershed on the tail end of big storms to download turbidity and flow data. Throughout the year we also collected data to analyze the impacts of different logging regimes and land management practices on fluvial geomorphology, rainwater infiltration and groundwater recharge.

In Year 14, I volunteered for the Mattole Restoration Council, where I continued working for most of the next decade after WSP. I was drawn to restoration for the opportunity to actively engage with watershed recovery. A process that I'm still inspired by and involved in today.

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Lost, Yet Found

By: Kunal Mehta, Placed at CA Department of Fish and Wildlife Coastal Watershed Planning and Assessment Program

A watercolor portrait of Hooker Creek, a tributary to the South Fork Eel, painted by Kunal Mehta, serving at CA Department of Fish and Wildlife, Coastal Water Planning and Assessment Program.

Dawn stretches her rose gold fingers across the sky bleeding violet through the misty shroud.

A blanket slowly pulled back unveils towering redwoods that enrapture mystery and invokes awe.

We journey deeper into the home of the Giants, rising and falling, weaving in and out, moving with the land, and moving with the water.

The air is cold, fresh from the dew that still clings to every pine needle, every petal of flower, and every blade of grass.

The sound of the rushing creek, song birds calling, pileated woodpeckers hard at work.

The Odyssey takes us under the canopy of old growth aged centuries before this one, through high flowing rapids, over fallen logs and boulder gardens.

Don't blink,
You'll miss it
Did you see?
There's a fish!

Excitement! Jubilation! A sight for celebration!

Not too loud though, you'll scare her.

A moment of wonder,

Mother Nature at its finest.

We are lost on Nature, yet found on purpose.

Drawing by Hannah Carroll, serving at CCC Fortuna, that depicts the importance large woody debris installation has on salmonid habitat.

Hannah Carroll using a long drill to anchor large woody debris structures. Photo credit: Emma Held

Large Woody Debris

By: Hannah Carroll, Placed at CCC Fortuna

At the California Conservation Corps Fortuna center, Members have the awesome opportunity to participate in designing and installing large woody debris structures in salmonid-bearing streams. These structures consist of large logs that are placed in the stream and carefully adjusted with a griphoist, which allows for objects weighing thousands of pounds to be moved by a small hand crew. The logs are then anchored with rebar to rocks or live trees on the streambanks. When constructed properly, these structures can last for decades.

Large woody debris structures play many roles in improving salmonid habitat. They provide shelter from predators for young fish making their way to the ocean, offer adult salmonids a place to rest out of the heavy flows as they make their way upstream to spawn in their natal creeks, and can even change the geomorphology of extremely channelized streams into more suitable habitat.

With this drawing, I wanted to highlight the importance of the work we do in improving salmon habitat with LWD structures. The fish facing downstream represents first the juvenile salmon's journey downstream to the ocean, using the log structures as shelter from predators in an otherwise unprotected stream. The fish facing upstream symbolizes the long and difficult voyage back upstream to spawn. The structures, having scoured out deep pools where the logs dig into the streambed, provide a place to rest out of the high-velocity flow, allowing the salmon to reach its destination, spawn, and continue the cycle.

Salmon in Shifting Seas, continued from page 1.

thermal stratification, which refers to the development of two discrete layers of water within the water column with different temperatures. In other words, very warm surface temperatures with cooler water below, but why does this matter to salmon?

The answer lies in phenology, or the seasonal changes that salmon and the organisms they rely on undergo. A dragonfly emerging from its chrysalis, or the migration timing of birds are examples of this phenomenon. Marine heat waves disrupt the phenology of salmon migration and the prey they consume in the ocean. Warmer temperatures drive earlier phytoplankton blooms and changes in prey abundance (Auth et al 2017) which may result in fewer growth opportunities and increased mortality within salmon populations (Daly et al 2017). In summary, by the time salmon migrate into the ocean, the prey they must consume to grow, survive, and successfully reproduce may not be available.

This all sounds pretty bleak, but what can we do about it? As humans, we must recognize the growing threat posed by climate change and the immediate need to take drastic action. As restorationists, it highlights the need for a more process-based, holistic approach. It is not enough to target one organism or habitat. We must expand the focus of our research to include watersheds in their entirety, from the headwaters out into the estuary and marine environment, and all food web interactions therein.

Kunal Mehta, serving at CDFW Coastal Watershed Planning & Assessment Program, is carrying willow cuttings to be planted in a riparian area to increase the stability of the bank.. Photo Credit: Sienna Streamfellow

Jordan Garcia, serving at the North Coast Regional Water Quality Control Board, is pictured here pounding willow cuttings into the banks of a riparian area. Photo credit: Sienna Streamfellow

References:

Auth, T., Daly, E., Brodeur, R., and Fisher, J. (2017). Phenological and distributional shifts in ichthyoplankton associated with recent warming in the northeast Pacific Ocean. Global Change Biology, 24(1):259-272.

Daly, E., Brodeur, R., and Auth, T. (2017). Anomalous ocean conditions in 2015: impacts on spring Chinook salmon and their prey field. Marine Ecology Progress Series, 566:169-182.

Oliver, E., Donat, M., Burrows, M., Moore, P., Smale, D., Alexander, L., Benthuysen, J., Feng, M., Gupta, A., Hobday, A., Holbrook, N., Perkins-Kirkpatrick, S., Scannell, H., Straub, S., and Wernberg, T. (2018). Longer and more frequent marine heatwaves over the past century. Nature Communications, 9(1324).

Alumni Spotlight: Monica Scholey, continued from page 9.

2. Was there one experience that was particularly memorable? Why?
I'll never forget my first riparian tree planting project. We were working in Grindstone Creek and planting bare root Doug-fir trees. We carried heavy tree bags filled with trees and hiked up and down landslides all along a creek full with winter flows and the large pink rocks that Grindstone Creek was named after. Even though I was tired and blistered, I loved the process of probing the landscape with a hoedad and finding that perfect pocket of soil or microsite to for each tree.

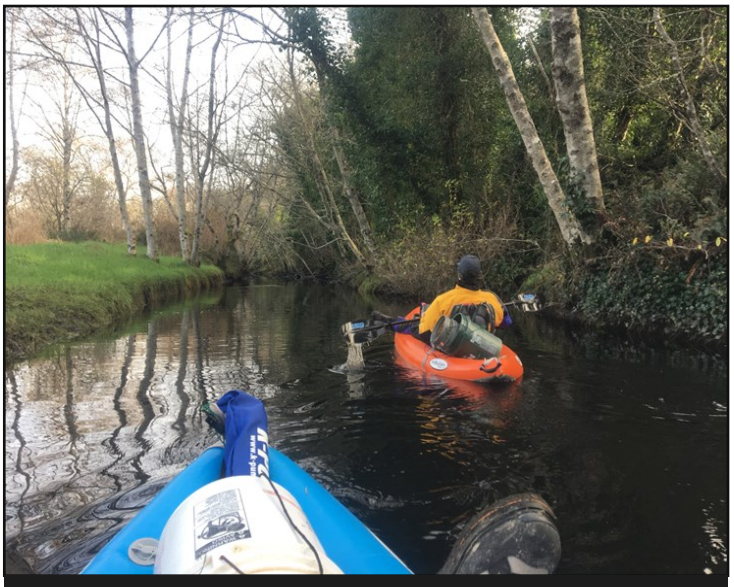
3. What is your current title? What are your responsibilities in your current job?
Currently I'm the Smith Estuary Restoration Program Coordinator for the Smith River Alliance. I work with the SRA team to plan, design and implement habitat restoration and land stewardship projects in the Smith River Plain. SRA is a watershed organization, founded in 1980. Our mission is to provide for the long-term protection, restoration, and stewardship of natural resources in the Smith watershed. Through this work I bring together local farmers and ranchers, engineers and geologists from consulting firms, agencies and partner organizations to design multi-benefit projects that restore ecological processes and serve the needs of the local community.

Monica Scholey, WSP Year 13 & 14, currently working as the Smith Estuary Restoration Program Coordinator.

4.How did WSP help prepare you for the work you are currently doing?
WSP provided exposure to a range of careers and the opportunity to explore and find my passion. It provided training and mentorship and a network of colleagues throughout California.

5. Do you have any advice for current WSP Members?
Explore and build community. Take full advantage of the network of alumni and current Members working across the state. Ask for the opportunity to visit other Placement Sites during your slow season and recruit other Members to visit your site during a busy season. WSP Alumni are working across the state in every capacity and we are happy to share our experiences and offer mentorship.

Part of Monica's job entails soil sampling for bulk density. Photo credit: Monica Scholey



Monica trapping minnows in Elk Creek.. Photo credit: Monica Scholey

Community and California Conservation Corpsmembers came together in Santa Rosa to participate in a restoration event hosted by Shayda Abidi and Adrienne Chenette, serving at the Russian River Salmon and Steelhead Monitoring Program. Photo credit: Emma Held

Restoring landscapes to enhance anadramous waterways is fundamental to our mission. Often, this entails planting native species in areas that have been disturbed. Here, Marisa McGrew serving with CCC Fortuna is planting native grasses in an area disturbed by fire. Photo credit: Emma Held

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ccc.ca.gov/watershed-stewards-program/

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This material is based upon work administered by CaliforniaVolunteers, the Office of the Governor and sponsored by the Corporation for National and Community Service and the California Department of Fish and Wildlife.